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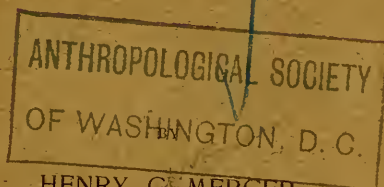




AN

EXPLORATION OF DURHAM CAVE

IN 1893



DEPARTMENT OF
AMERICAN AND PREHISTORIC
ARCHAEOLOGY, AT THE
UNIVERSITY OF PENNSYLVANIA.

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BY HENRY C. MERCER.

INTRODUCTION.

As Rafinesque, who visited it in 1834, describes the single ingress looking eastward upon the river as “a shelving entrance

¹ This disastrous attack upon the limestone for lime-making in the kilns and ore-smelting in the neighboring Durham Furnace began, according to Mr. Laubach, in 1854; but Mr. Fackenthall, director of the furnace, who says that the site of the cave was bought by Mr. Joseph Whittaker for the company in 1847 and that the lime-kilns were not built before 1848, assures me that no internal disturbance was effected in the cave by blasting before 1866.

² Jacob Nichols, a workman who remembered the cave since 1825, told me in 1893 that the original entrance stood on the south side of the present slag track. He remembered a series of rooms running in many directions, and William Martin, who had come from Ireland in 1848 and was familiar with the cave before its destruction, further testified to the size and number of the underground rooms.



FIG. 47.—Durham Cave (right bank of the Delaware River, at the mouth of Durham Creek, Bucks County, Pennsylvania), as it appears in 1896. The open foreground indicates the area occupied by large chambers blasted away by the Durham Iron Company, the original entrance to which must have been somewhat nearer the observer than the extreme front of the foreground, or about 100 feet nearer than the present opening. The Delaware River is about 150 feet behind the observer. Photographed, July, 1896.

30 feet wide and 10 feet high,"¹ and as a writer in Hazard's Register (for March, 1828, Vol. I., p. 132)² speaks of a considerable enlargement, narrowing below into an entering rift broad enough to admit three persons abreast, the outermost chamber,

¹ Rafinesque speaks of it as extending inwards 300 yards. He says that it was not remarkable for any great wonder and contained no fossils, though he tells us that he only went a little way into it.

² His full description, given from a series of hasty and sometimes very incorrect guesses at the dimensions made on August 6 and October 12, 1802, is as follows: "The entrance into the grotto is about one hundred yards west of the Delaware River, and from one hundred and fifty to two hundred north from the point of land at the confluence of Durham Creek and said river. The height of the eminence enclosing the cavity is from two hundred to two hundred and thirty feet above the level of the circumjacent land. From the pathway of the entrance to the top of the rock above the measurement is upwards of forty feet. Three or four persons may easily enter abreast, but no more, as the mouth, though wide enough for admitting a great number, is rendered inaccessible by a ledge of rock running partly across. The cave is naturally divided into three grand apartments, into each of which out of the other the descent is steep, caused also by rocks prominent and jutting. After a descent of almost thirty feet the first apartment or chamber displays its greatest height and width, of which it is not an easy matter to form a true estimate on account of the irregularities in the vault occasioned by deep interstices and low dependent stone. A faint idea of its dimensions may, however, be formed from the following statement: first apartment, ninety feet long and averaging thirty-three feet wide and twenty feet high; second apartment, ninety-six feet long and averaging forty feet long and twenty feet high; third apartment, ninety-three feet long and averaging sixteen feet wide and seventeen feet high. Length of the whole cave to the water's edge at the bottom, 279 feet; breadth of the water, twenty feet. On October 12 the thermometer in the open air stood at 64°, but descended to 59° at the partition between the first and second apartments. Between the second and third apartments it sunk to 54°, which temperature it preserved throughout the whole innermost chamber. On August 5 the thermometer was very differently affected by the enveloped air, standing then in the open at 78° and at the lower end of the first chamber at 54°, but at the farther end of the lowermost rising to 62°.

"On some parts of the vault is a white parget, somewhat crystallized and probably a petrification composed of water exuded through the rock and calcareous matter. By the assistance of a hammer it is easily severed from the stone to which it adheres, some of it yielding to the pressure of the fingers. Over the parts of the arch there was another kind of incrustation dark in color, having the appearance of moss upon a tree, but as hard as the rock itself; over it water is continually trickling. The rock encompassing the cavern is entirely limestone, through which

which the latter writer says was 90 feet long by about 10 feet high, must have been to some extent light. If it was dry, as we may suppose from the surrounding drainage, it should have

in many places there is perpetual percolation of water. By supposition the descent in a right line forms an angle of 40° with the horizon.

"At the bottom a basin of excellent water, which measured twenty feet at the place where it came into contact with the rock, terminates the cave as far as it has been or can be explored. Beyond the meeting of the rock and water there is a conduit running farther into the earth than could be measured with a long pole, and this is undoubtedly continued, though it may ramify into many subordinate channels before it advances to the beds of the river and creek. The many springs on the verges, the proportionate rising and falling of the water contained in the cavern, with the flowing of the waters in the river and creek, demonstrate the connection of the subterranean waters with those outside, and prove the surface of the one to be on a level with that of the other. When there is a high freshet in the river the lowest chamber is nearly filled.

"At the partition between the first and second apartments a small branch of the cave, thirty-two feet in length and so wide as to permit in some places two persons to pass, takes a course in an easterly direction. From this branch lead two others still smaller, the one extending twenty-two feet north and the other in width admitting one person, continuing fourteen feet south."

Judging from the statements of workmen as to the position of the entrance, I guessed that it was 200 feet out from the present (1893) arch which, added to 135 feet for the remaining room, would make the original cave 335 feet long, though the above writer's length of 299 feet is probably correct. But Rafinesque's 300 yards is out of the question, as is also the length, about 150 feet, given by Davis. (See History of Bucks County, by W. W. H. Davis, p. 652.)

The present inner chamber may have been lengthened by blasting so as to permit the Hazard writer's estimate of its length of $93 + 20 = 113$ feet to be correct, although it seems now to measure 135 feet without allowing for its destroyed outer end, while the present height, 21 to 28 feet just under the arch, diminishing to 10 feet at the water's edge, fairly corresponds with the average for height (17 feet) given in Hazard. Hazard's 300 yards to the river and 150 to 200 yards to the mouth of Durham Creek from the entrance, should be correct by my approximate measurements of 310 feet and 190 to 200 paces for these distances, respectively. But he is altogether wrong in saying that the cave hill, not seriously lowered by blasting, and which does not now measure above 90 feet in height (I found it 83 feet with a monocular level), could ever have been from 200 to 230 feet high.

In an examination made on March 27, 1896, when the river, swollen by rains, stood at a height of about 10 feet above its ordinary level, I found the cave pool at from 3 to 6 feet below the river level and that of Durham Creek. Both streams were muddy, while the cave water was clear, precluding the idea of immediate underground communication.

offered a desirable shelter to savages, thus fulfilling one of the first conditions of a cave shelter chosen for visitation by aborigines ill supplied with lights, and who in my experience in the eastern United States have not left evidence of their haltings in rooms that were dark.

Had the floors of Durham Cave been periodically overwhelmed by freshets of the Delaware, which, catching up the associated remains of men and animals, might have whirled away or hopelessly mixed the epoch-denoting layers, there would have been small use at any time in examining the cave earth for such evidence of man's antiquity as similar caverns have furnished in Europe. But the entrance to the cave must have been by my estimate about 25 to 30 feet above even the highest known freshet mark of 1841, so that another condition, that makes of a subterranean floor deposit an important palaeontological and human record, namely, permanency of environing conditions, was fulfilled.

A less public and conspicuous position (in one of the inland ravines to the westward, for instance) might have subtracted from the significance of the original shelter; but since its black doorway looking eastward over the river lawn from the slope of an isolated eminence, and set close upon the water, must have continually tempted the savage foot-wanderer — since, further, all passers-by following the river only 300 feet away, or halting at the mouth of Durham Creek, must have seen the cave, its situation satisfied another archaeological desideratum, namely, that of publicity and ease of access.¹

These conditions leading the investigator to regard some caves as of much, and others as of little, significance would have warranted us in ascribing special importance to Durham

¹ To realize after investigation that the remains of Indians are more numerous and their village sites larger on the main stream than anywhere else in the Delaware Valley, is to suppose, not without reason, that the immediate shores of the river would have first and longest attracted the attention of any immigrant to the region.

Cave in its original and undisturbed condition, at least during the time within whose limits we venture as yet to speculate as to human presence in eastern North America, in other words, during that geological portion of the Pleistocene, in which man has been demonstrated to have existed in Europe, while the Delaware hills and valleys have been as they now are, and while we may suppose the cave to have held the same relative position to man that it held when the blasting began. If Pleistocene man existed at Trenton, he may well have ascended the river thirty miles, seen the cave, and entered it. If in the milleniums that are alleged to have intervened between his appearance and the discovery of America, any intermediate people, lower in the scale than the aborigines known later to white men, passed that way, the cave could not more easily have escaped their notice than it escaped that of the Lenni Lenape Indians, one of whose village sites confronted its entrance.¹

¹ According to Mr. Charles Laubach, mounds, trails, clearings, and abundant fire-sites at the spot marked the position of the Indian village referred to in certain Pennsylvanian records of the seventeenth and eighteenth centuries as *Pechqueolin* (*Pechotwoallenk*, where there is a great depression in the land). Anthony Laubach, father of Charles, remembered stone-paved Indian fire-places set along the river margin in the alluvium extending from Riegelsville Bridge to the mouth of Durham Creek. The circular areas, raised about 12 or 18 inches, and about 6 feet in diameter, composed of burnt stones imbedded in ashes, did not extend in a straight line, but were irregularly disposed, and appeared to stop at a place seemingly devoted to the manufacture of arrowheads. Then, beginning again, they continued to the entrance of the cave. Seen first about 1812 they remained until 1841, when the great freshet for which that year was famous destroyed them all. The digging of the Delaware and Lackawanna Canal had previously obliterated a large portion of the village site with other fire-places. Cultivation continuing the work of destruction, finally completed it when three mounds on the top of the hill behind the cave, about 20 feet in diameter by 6 to 8 feet high and extending in alignment north and south, were ploughed down by William Walters in 1853-55.

Walters, who had measured before destroying them, had found or noticed nothing in them. An Indian trail had followed the right bank of Durham Creek for some distance inland along its ravine from which another trail, passing through an Indian clearing on the top of the hill above the cave, returned down the slope to the village. When Charles Laubach saw this clearing, — which remained surrounded by a forest as late as 1855, — it comprised about seven acres, and ran from

That the comparatively recent inhabitants of this village with their row of fire-sites along the river close by, with their mounds on the slopes behind, and beaten trail passing the cavern to ascend Durham Creek, must have paid frequent visits to the subterranean rooms ; and that they left traces of their presence on the floors there can be little doubt, while it is certain that bones of animals through various agencies had become scattered in and upon the cave earth, notwithstanding the statement of Rafinesque, who after a hasty look said that the cavern contained no fossils.

Mr. Laubach informs me that Professor H. D. Rogers, the state geologist, who examined the cave about 1856, found in it numerous Indian implements associated with animal bones, which former specimens, on being afterward sent to Dr. Swift at Easton, were burned in a fire at Pardee Hall ; while Professor Rogers says (Geology of Pennsylvania, by H. D. Rogers, Vol. I., p. 231) : "This cave was found many years ago to contain some interesting fossil bones, an account of which will be found in another chapter."

east to south in longest diameter. Both in the clearing and close to the neighboring three mounds, grooved stone axes were found, while at a point some distance up the river and close to the present Morgantown Road, Mr. Laubach remembers having seen from twelve to fifteen standing stones, the survivors of a group of about twenty-five formerly observed by Mr. Walters, all of which save one about 3 feet high, now remaining as a boundary mark by the Morgantown roadside and seen by me in 1893, were afterwards used to build the wall of a neighboring barnyard.

The monoliths must have been carried to the spot by Indians, since the rock *in situ* is limestone, and the Potsdam sandstone of which they consisted does not occur within two miles of the place. Earlier villages may have been overwhelmed by freshets at the site of *Pechaqueolin*, according to Mr. Laubach, who says that he discovered arrowheads deeply buried in the alluvium after its exposure by the 1841 freshet ; or, according to workmen who tell of a pipe discovered six feet below the surface in a sand pit. Two skeletons interred with beads were found near the river two feet under the sand at the upper end of the site in 1868-70.

A band of Shawnees, who had been quartered with the Delawares, left the Durham site, according to Mr. Laubach, in 1728, except a small remnant who remained upon Brandywine Creek, a tributary of Durham Creek, until 1780.

What became of these fossils we fail to learn from Professor Rogers, who never mentions them again in his two volumes; but if, as Mr. Laubach alleges, he sent them to the Academy of Natural Sciences of Philadelphia, some of them at least are represented in a list of animal remains from Durham Cave found afterward at the Academy and identified by Dr. Joseph Leidy as those of

Black bear	<i>Ursus americanus</i>
Raccoon	<i>Procyon lotor</i>
Gray fox	<i>Vulpes cinereoargentatus</i>
Skunk	<i>Mephitis mephitis</i>
Woodchuck	<i>Arctomys monax</i>
Porcupine	<i>Erethizon dorsatus</i>
Beaver	<i>Castor fiber</i>
Muskrat	<i>Fiber zibethicus</i>
Gray squirrel	<i>Sciurus carolinensis</i>
Wood rat	<i>Neotoma floridana</i>
Gray rabbit	<i>Lepus sylvaticus</i>
Deer	<i>Cervus virginianus</i>
Elk	<i>Cervus canadensis</i>
Moose	<i>Alces americanus</i>
Wild turkey	<i>Meleagris gallopavo</i>
Box turtle	<i>Cistudo clausa</i>
Snapper	<i>Chelydra serpentina</i>
Snake	<i>Eutaenia sirtalis</i>
Sturgeon	<i>Acipenser sturio</i>
Catfish	<i>Amiurus atrarius</i> . ¹

Whether this list represents all the specimens collected by Professor Rogers or not, Mr. Laubach has learned that, besides

¹ Mr. Laubach informs me that several boxes of bones gathered in the cave by Professor Rogers (marked "Durham Bone Cave, H. D. Rogers") were sent to the Academy of Natural Sciences of Philadelphia from Durham about 1845-55. All or some of these boxes were doubtless discovered by Dr. Joseph Leidy, who, after ransacking the cellar or museum of the Academy in 1887, appended to a paper on Hartmans' Cave (see *Fossils in Caves*, by Professor Joseph Leidy, Pennsylvania Geological Survey, 1887, p. 1) the above list of the remains of 20 vertebrata representing "a small collection of bones" contained in the museum of the Academy, "presented about forty years ago, but of which I can find no record."

the bones above referred to and sent to the Academy, others were subsequently found during the demolition of the cavern by workmen. I remember when a boy noticing several on the cave floor while one of the later alchambers was partly intact, about 1873, and heard from workmen in 1893 that human remains (suggestive of cave burial) had been found in smaller fissures. At the latter date Robert Barnet, who had seen the cave before its destruction, told me that he remembered the bones, horns, and teeth of animals lying on the surface in the cave, so exposed to the view of visitors that they were frequently carried off as curiosities.

Such were the probabilities in favor of supposing a considerable deposit of human and animal remains to have existed on the original cave floor that it seemed worth while, notwithstanding the fact that two-thirds of the rock walls and roof had been blasted away, to cut through the mantle of downfallen débris now overspreading the former cavern area, so as to lay bare if possible the old subterranean accumulations where they were most significant. But the attempt failed.

A SEARCH FOR THE ORIGINAL CAVE FLOOR.

How nearly the newly blasted faces of the walls of the amphitheatre coincided with the outer limit of the original chamber walls, it was impossible to say, since by all accounts the arrangement of rooms had been quite irregular, and no water-worn surfaces remained to suggest the previous contours. Neither was it easy to guess the true position of the former floors if they existed, since the thick mantle above mentioned of rock splinters and clay, which had dropped from above when the roofs fell, covered the larger part of the area once occupied by the subterranean rooms. Furthermore, as many parts of any cave floor are unavailable for digging, owing to dampness, slope, fissures, and relation to light and passages, it remained to

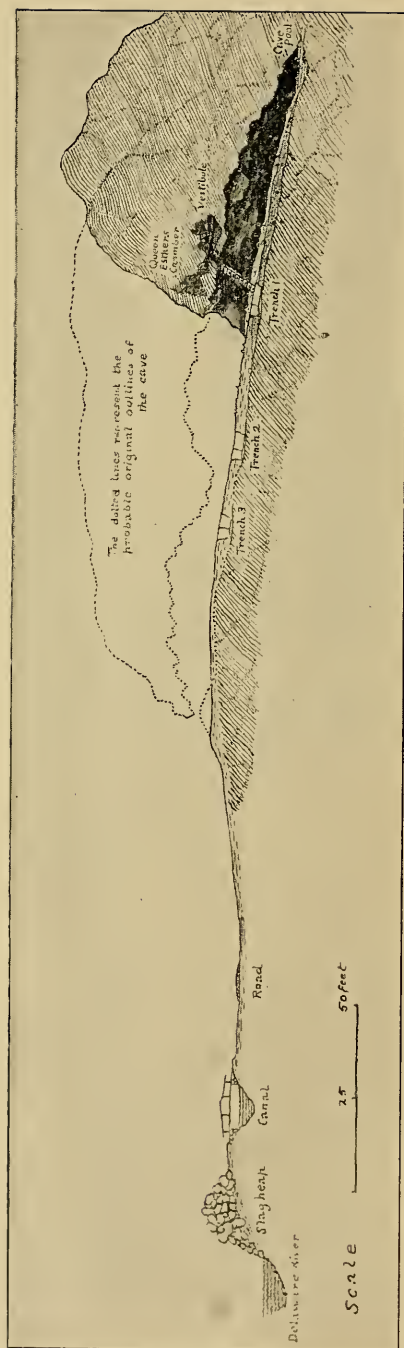


FIG. 48. — Diagram representing the present and probable original configuration of Durham Cave (right bank of Delaware River, at the mouth of Durham Creek, Bucks County, Pennsylvania), showing the position of Queen Esther's Chamber, where the bones of the extinct peccary were found associated with the remains of modern animals, and the site of our trenches dug in search of culture layers in the floor area of the original chambers. The dotted lines include the original portion of the cave destroyed by blasting. Explored in September, 1893.

be seen whether a reasonable number of trenches sunk through the rubbish would reveal the buried evidence we sought. Joseph Nicholas, one of the quarrymen, said that the cave floors were blown up, though he had not seen it done, while William Cyphers, also present at the blasting, denied their destruction, a statement seemingly corroborated by our own excavation of three trenches through the rubbish (see Fig. 48): (1) 20 feet long by 2 feet 10 inches wide by 4-6 feet deep; (2) 14 feet long by 4½-5 feet wide by 7 feet 3-5 inches deep; (3) 7 feet long by 2 feet 10 inches wide by 7 feet 7 inches deep; at distances of 90, 175, and 222 feet east of the margin of the cave pool, noticed in the above quoted account from Hazard covering the inner lower end of the remaining chamber. The water-worn ledge revealed at the bottom of each trench, and evidently the original rock bottom of the cavern, showed no signs of blasting, but the hardness of the superincumbent rubbish and its depth, with the cost and difficulty of removing it, induced me to desist on the completion of the third trench.

The conditions in all three excavations were unsatisfactory. A hard-caked mass of recent quarry rubbish mixed with bits of coal slag, and here and there fragments of animal bones (elk, carnivore (?), gray fox, wood mouse, porcupine, and squirrel), 7 feet 7 inches deep in the third trench, 7 feet 3-5 inches in the second, about 3½ feet thick in the first, rested upon whatever represented the original foothold of the cave. In the third trench no deposit was clearly found to intervene between the rubbish and the solid water-worn ledge on which it lay, so that we reasonably inferred either that the original cave earth on the ledge had been removed during the blasting, or, as seemed more likely, that we had reached a bare rock slope or level where no earth had ever accumulated. In the second trench no clear line of demarcation or conspicuous variance in the character of the rubbish indicated the existence of an under-placed layer, though to the original foothold probably belonged

a few quartzite pebbles lying close to the surface of the rock, and which may have been brought into the cavern by Indians or washed in by the higher Post-Glacial freshets. In the first trench, however, a layer of original cave earth lay upon the rock floor and under the rubbish. It contained the following bones, kindly identified by Professor Cope : the upper incisor and various bones of the wood mouse, *Peromyscus* (at a depth of 5 feet 4 inches) ; the radius (at 6 feet 10 inches), femur (at 3 feet 3 inches), and upper incisor (at 4 feet) of the porcupine, *Erethizon dorsatus* ; two femora (at 6 feet), a tibia, and metatarsal (at 7 feet) of the rabbit, *Lepus* ; and the rib (at 5 feet 4 inches) of a snake (undetermined).

As it pertained to what must have been a dark and damp inner room of the cave, this layer did not surprise us by containing no trace of the hearths and ash-bands that would have denoted the haltings of early man at the spot. Thus the true floor deposit that appeared absent in the outer two trenches, when found in the inner, was insignificant and at the wrong end of the cavern, while the scanty remains of animals scattered in it by whatever agencies, and lacking certain signs of human association, represented modern species and suggested no new estimate for man's antiquity.¹

¹ The detailed description of these trenches is as follows: TRENCH 1, 2 feet long by 2 feet 10 inches wide, was sunk at a spot just under the rock arch and about 96 feet outside the margin of a pool of water above described at the base of the cave. This revealed first *Layer 1* of down-fallen rubbish and splinters, 2 feet deep inside to 3 feet 7 inches deep outside, sprinkled towards the bottom with the small bones of bats. Next came *Layer 2* of reddish clay about 2 feet thick, somewhat disturbed towards the top and containing the bones of the wood mouse, squirrel, porcupine, rabbit, and snake described above. Notwithstanding the disturbance which characterized the top of this clay, it appeared that our search had been rewarded at the outset by discovering in it a portion of the original floor deposit ; nevertheless the fact was of little real importance, and when we considered that the place examined must have represented the soil of the wettest, darkest, and least inhabitable portion of the cave, some part of the lowermost chamber probably subject to overflows of the cave pool, there was little reason to be surprised that no trace of charcoal or ashes, no relic of human handiwork, gave evidence

that man had halted and built fires at the spot. Below the clay the pick-axes clanged on a solid ledge of limestone opening within the area of the trench into a narrow fissure with rounded sides into which the clay containing bones continued. Where this narrowed to a breadth of about 8 inches at a depth of about 6 feet from the top of the trench, we stopped digging.

TRENCH 2, 6 feet long by 4 feet wide and 175 feet out from the margin of the cave pool, showed *Layer 1* a disturbed mass of clay and limestone splinters, continuing from the surface of the ground to a ledge of solid rock at a depth of 6 feet. Several fine bits of coal sprinkled through this rubbish gave clear evidence of its recent disturbance. That much of it had fallen down from the original outer surface of the hill, and that it had been considerably mixed and moved during the process of blasting, there could be little doubt. Two feet down in it was found a fragment of the horn of an elk, *Cervus canadensis* (see Fig. 50, object 22), much gnawed by animals, about $2\frac{1}{4}$ inches long by $1\frac{3}{4}$ in diameter, with the softer bone inside removed for about $\frac{1}{2}$ inch, suggesting in its shape the bone haftings of stone blades found in the Swiss Lake dwellings. Resting upon the rock bottom we found several quartzite pebbles from $1\frac{1}{2}$ –3 inches in diameter, whose presence was not easy to account for. Had they been brought into the cave by Indians for the purpose of blade-chipping, some of them would doubtless have shown abrasions upon their sides; but neither such traces of use, nor the stainings or scorplings sometimes characteristic of pebbles found about the fire-sites of savages and inferably used for cracking marrow bones, were found upon any of them. Though it was possible that they had fallen with the débris from the top of the eminence, we failed to find similar pebbles upon the outer surface of portions of the hill not yet disturbed by blasting, and it seemed more reasonable to suppose that Glacial freshets had washed them inside the rock arch.¹

The hard-caked rubbish yielding grudgingly to the blows of the pick-axe, and appearing generally homogeneous from top to bottom, had revealed no line of subdivision upon its exposed face to warrant our supposing that even its lower portion, containing the pebbles above referred to, constituted an original and undisturbed, if non-relic-bearing, portion of the cave floor.

Disappointed at the result, we tried again, sinking TRENCH 3 (7 feet long by 2 feet 10 inches wide) in line with the other two, and following the original axis of the cave, as we guessed at it, at a point 222 feet out from the edge of the pool. Here again the disturbed rubbish, clay, limestone fragments, bits of coal, and loam, continuing down without an apparent break, rested on a ledge of seemingly water-worn rock, the probable bottom of the cave, at a depth of 7 feet 6–7 inches. The hard digging disclosed the tibia (at 6 feet 2 inches) of a carnivore unidentified, and the tibia (at 6 feet 3 inches) of the gray fox, probably *Vulpes cinereoargenteus*. But as little could be inferred from these specimens, we thought it wise to desist.

¹ Mr. R. W. Raymond of the Durham Iron Company informed me that in a colliery near Wilkesbarre a mass of rock splinters produced by blasting in one of the galleries had been rolled into pebble form after the passage had been subjected to the action of rushing water in a year and a half; but these pebbles being of quartzite, not limestone, were not original constituents of the cave, and must have come from a distance.

EXCAVATION OF QUEEN ESTHER'S CHAMBER.¹

A hole in the roof close under the left end of the remaining arch and reached by a step-ladder (at a point where a ledge conducting to it had been destroyed by blasting) led by a sharp turn on the left (east) to a steep, upward passage 13 feet long by 1 foot 3 inches broad and 7-10 feet high at the entrance, broadening with irregular walls to about 7 feet inside, and then contracting at its extremity to a crevice 2 feet 10 inches wide, but of ample height. This opened into the so-called Queen Esther's Chamber, an irregular room (see Fig. 49) about 14 feet wide by 12 feet in diameter by 8 feet 7 inches in height at the highest part of its irregular crevassed roof. The soft, mealy, cave earth bedding its floor, when gathered in handfuls, revealed in the candle-light an admixture of particles of charcoal, and when cleaned out entirely showed walls trending together into a V-shaped cavity, where the west wall sloped east at a sharp angle to meet the perpendicular east face. The roof was somewhat blackened with smoke, and one of its several irregular indentations communicated with a particularly black fissure about 8 inches in diameter, under which, on burning a newspaper, a strong draught of the flames into it, indicated its occasional service as a chimney. As the place, save for a few

Not only had we failed at three points to discover clearly marked culture layers upon the cave floor, but in no instance had our work revealed certain signs of ancient human occupancy. Though we had reached original portions of the rock floor uninjured by blasting, our efforts had probably been directed at points too far from the entrance, too damp originally, or too dark to have served as the chosen halting-places of aboriginal cave visitors.

¹ Probably recently named after the half-breed reputed daughter of one of the French governors of Canada, Catherine Montour, called Queen Esther, who exercised a controlling influence among the Susquehanna Indians during the Revolution, and who has been supposed (see Hollister's *History of the Lackawanna Valley*, p. 170), but perhaps without good reason (see Sherman Day's *Historical Collections of Pennsylvania*, p. 144), to have presided over the killing of white prisoners by Indians after the battle of Wyoming in 1778.

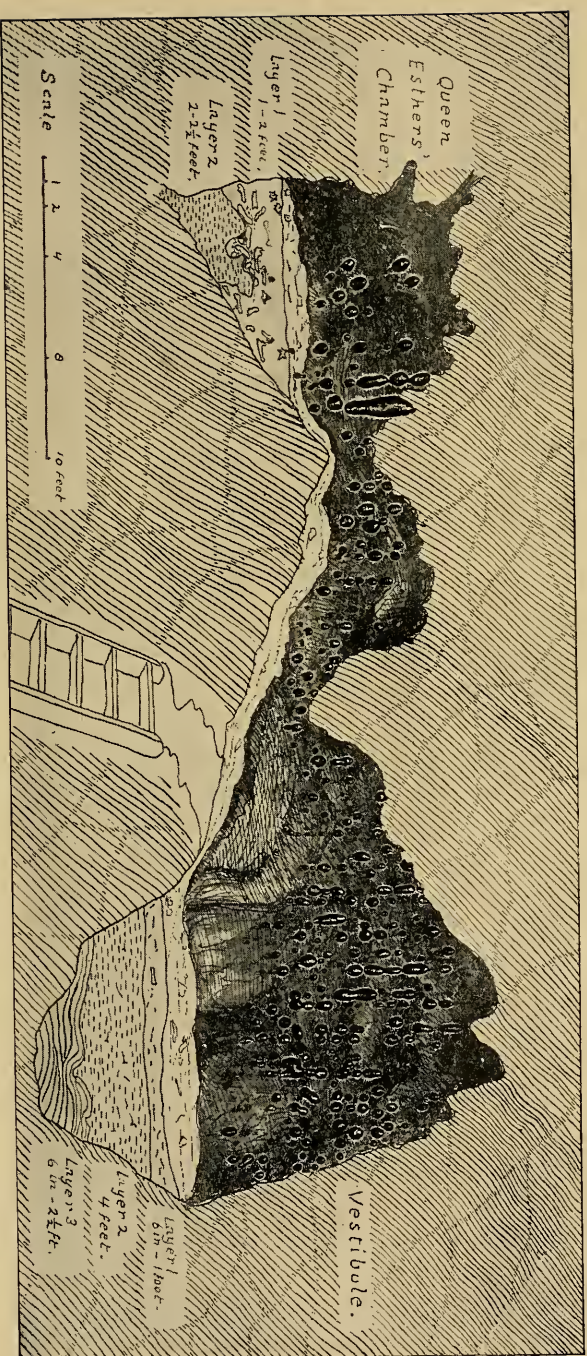


FIG. 49.—Queen Esther's Chamber and its vestibule at Durham Cave, Bucks County, Pennsylvania. The drawing shows the site of the discovery of the bones of the extinct peccary, associated with the remains of modern animals, in the cave earth, whose subdivisions are represented as they were exposed by excavation in September, 1893. The animal bones, often showing the marks of gnawing teeth, had probably in many cases been carried from their original positions in other parts of the cave to these inner recesses by rodents and carnivores.

rays of daylight at the entering crevice, was dark, candles were necessary at the digging, when the removal of the cave earth revealed the following layers :

Layer I (1 foot to 2 feet thick), consisting of soft brown cave mould comparatively dry and containing bits of charcoal and pieces of decayed wood, showed evidence of small fires recently built about its surface. Near its bottom we encountered a darkened deposit containing intermixed pieces of charcoal, 7 fragments of rotten wood from 2-4 inches long, and a store of 7 butternuts and 3 walnuts gnawed by animals (see Fig. 50, objects 1 and 2). Three of the wood fragments were charred, and one $3\frac{1}{2}$ inches long showing the bark on one side revealed a cut across the grain at one end, which, as compared with my remembrance of the marks of stone blades on the sharpened billets found in the Indian jasper mines at Macungie, Lehigh County, Pennsylvania, and the broken-off staves made by Indians in the Wyandotte Cave, Crawford County, Indiana, looked like the result of a chopping blow with a metal axe or hatchet. At various depths in this layer (in the left (north) corner at about 2 feet 6 inches) were found upwards of 90 fragments from 1 to 4 inches long of the bones of animals, sometimes split as if by feasting savages for the purpose of extracting the marrow, sometimes scorched, and sometimes gnawed by animals (see Fig. 50, objects 17, 18, 19, and 20). The specimens identified by Professor Cope consisted of a humerus fibula and astragalus (gnawed) of the beaver, *Castor fiber*; the pharyngeal bone of the chub, *Semotilus*; the pectoral spine of the catfish, *Amiurus*; the lower jaw with two molars (see Fig. 50, object 9), a scapula, two humeri, an ulna, an ilium, and two ischia of the porcupine, *Erethizon dorsatus*; the sacrum and pelvis of the rabbit, *Lepus*; the canine tooth and lower sectorial molar (see Fig. 50, objects 4 and 5) of the black bear, *Ursus americanus*; the temporal bone, a part of the zygoma (gnawed), a piece of humerus (split and gnawed),

and an ilium (gnawed), together with about 50 undescribed fragments of the bones of the deer, *Cariacus virginianus*; a gnawed metacarpal of the wild cat, *Lynx rufus*; the lumbar vertebra of a carnivore (undetermined); the skull bones of the grouse, *Bonasa*; a piece of the carapace of the tortoise, *Cistudo* (see Fig. 50, object 7); two humeri, two femora, a tibio-fibula, and ulno-radius of a large frog, *Rana*; and the tibio-fibula of a small frog, *Rana*. With these remains lay two vertebra (of young animals) and part of the mandible (much gnawed) of the peccary, *Mylohyus pennsylvanicus* (see Fig. 51). As in the case of the other larger bones, it seemed reasonable to suppose that these fragments had been carried to the spot by rodents, while there was nothing to indicate that the animal had died where we found its remains. It was as to the age of these that the evidence spoke most conclusively. Of a light yellow color, and no less modern in appearance than the deer bones found with them, the interesting jaw and vertebrae presented no evidence of antiquity.

Just as many of the surrounding deer bones (some of which had probably been split for marrow by the Indians) showed marks of the gnawing teeth of rodents, so the peccary's jaw had been similarly gnawed, when still retaining its animal juices.

Other remains, referred to later, of the deer, porcupine, and beaver lay deeper than those of the peccary, and in an older subdivision (Layer 2) of the cave earth, while the jaw and vertebrae belonged to a superficial accumulation, which, beginning under the present conditions of the cave, was still forming. Whether the animal had or had not made part of an Indian feast in one of the outer chambers, whether it had come to the cave to die, or met its fate at the hands of man or beast, the evidence failed to show, but that it had existed as a contemporary of the modern deer, bear, porcupine, beaver, wild-cat, squirrel, grouse, and rattlesnake found with it, there could be

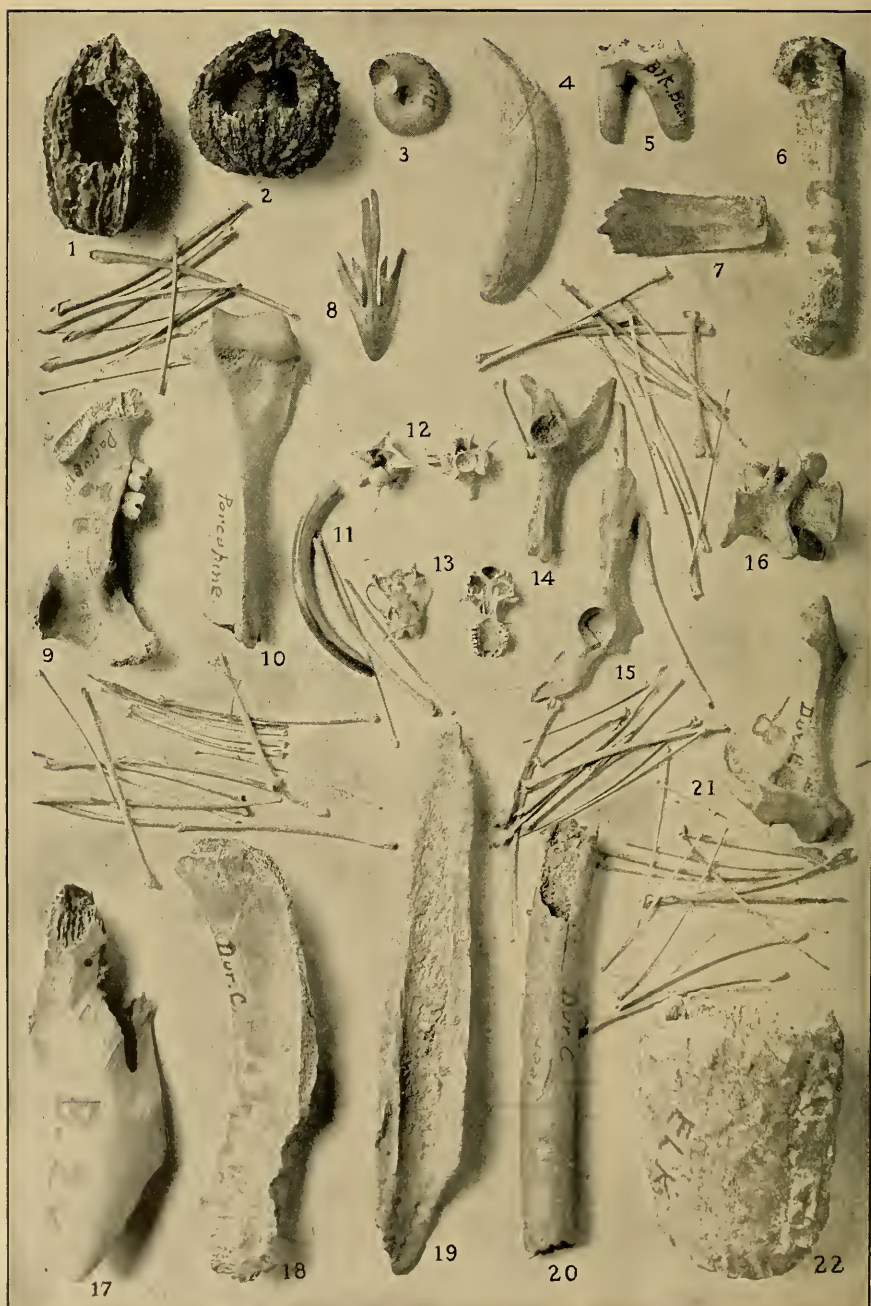


FIG. 50 ($\times \frac{7}{1}$). — Bones of the (4 and 5) black bear, (6) wild-cat, (22) elk, (17, 19, 20) deer, (9, 10, 11) porcupine, (18, 21) beaver, (14, 15, 16) rabbit, (7) land tortoise, and (scattered) bat, found associated with the remains of the extinct peccary (*Myiobhyus pennsylvanicus*) in Queen Esther's Chamber, Durham Cave, September, 1893.

no doubt. Reasonably to be regarded as a survival from, not as a representative of, an older time, it was proved modern by its association, and under the circumstances, though no evidence appeared to prove its contemporaneity with man, the probability cannot be denied that the Indian encountered or could have encountered it in the Delaware Valley.

The shells kindly identified by Professor H. A. Pilsbury (except the small mussel, *Unio complanatus*, perforated doubtless accidentally with a small hole) were all those of snails, many of which, though good for food, had probably found their own way into the cave. Close to the surface lay *Pyramidula alternata* Say, *Polygyra albolabris* Say, while at undetermined depths we found *Physa heterstrophia* Say, and two species of *Lymnaea catascopium* Say. With them, in the same layer, sprinkled about the surface and at various depths were unearthed numerous bones of bats (see Fig. 50, scattered upon the background), as to which I owe my thanks to Dr. Harrison Allen, of the Academy of Natural Sciences, who has kindly identified the series as belonging to two still existing species common in caverns, and of which I have obtained characteristic remains in the floor deposits of various caves in Tennessee, hereafter to be described. Dr. Allen determines two skulls (see Fig. 50, objects 13 and 14), several jaws, femora, tibiae, clavicles, and humeri, with two ulnas showing unnatural bone growth, as belonging to *Adelonycteris fusca*, and a humerus and ulna with several bones as those of *Vespertilio gryphus*.

Of the 50 deer bones found, 20 were split as if for the purpose of extracting the marrow, of which latter three were also gnawed, while two were split, gnawed, and scorched. Twelve unsplit fragments were gnawed and one scorched. On or about the surface were found 8 vertebrae of the rattlesnake (*Crotalus*), 4 vertebrae of the water snake (*Natrix* or *Eutaenia*), and at least 250 bones with fragments of skulls and teeth of bats. Below Layer 1 the comparatively finer brown cave earth of

Layer 2 (2 to 2½ feet in depth) continued down to the sloping ledges of the rock below. As we worked downward the bits of charcoal grew rarer, and the bone fragments, revealed by the light of candles, became scarce. Nevertheless disturbances seemed to have taken place below 2 feet, particularly along the sides and against the rock, where several bones and pieces of charcoal were found at a depth of 2 to 3 feet below the original surface: the ulna (?) and tibia (gnawed) of a beaver, *Castor fiber*; a lower incisor of the porcupine, *Erethizon dorsatus*; 2 split bones of a deer, *Cariacus virginianus*; and 1 scorched and 3 gnawed bones (undetermined).

The rock bottom revealed at last was very irregular, opening downward into several water-worn fissures about 2 feet in diameter, into which we did not excavate. Nowhere in the cave earth had we found sufficient deposits of charcoal and ashes to indicate the former existence of cooking fires at the spot, and the bones, gnawed, scorched, or split as they often were, seemed to have been brought to their final resting-place by animals who had either preyed upon the leavings of human feasts in the outer cave (as some of the scorched, split bones seemed to indicate), had distributed pieces of carcasses of animals found dead in the dark rooms, or had borne underground their quarry captured in the woods.

Queen Esther's Chamber recalled the dark crannies utilized for the sepulture of charred human bones by Indians in some of the Kentucky and Tennessee caves.¹ But no funereal traces were discovered, and notwithstanding its chimney it was too close and small, too far removed from the daylight to have

¹ A small damp room, accessible by a chasm with a rope, in Peckenpaugh's Cave (left bank of Ohio River at Peckenpaugh's Landing, Meade County, Kentucky), contained numerous charred human bones, with ashes, charcoal, and mussel shells, and the bottom of one of the shallow chasms along the main gallery of Lookout Cave (left Tennessee River bank just below Chattanooga, explored in 1893) was strewn with similar remains. We also found human bones lying upon shelf-like ledges facing the same main passage of the Lookout Cave near the entrance.

served as a feasting site for savages. The vestiges of fire, insignificant as they were, and the seemingly axe-cut limb spoke rather of the remains of torches or random lights kindled in modern times.

To complete the examination of Queen Esther's Chamber it was necessary to remove the floor earth of what might have been called its vestibule (marked "A" in the museum labels upon the specimens discovered), an enlarged bifurcation of the entering passage, opening to the right (west) as you left the top of the step-ladder. About 12 feet long by 4 to 5 feet wide, with irregular sides, and a ceiling extending upward possibly 20 feet into a narrow, dark fissure, its floor was found to contain a bed of cave earth, the removal of which revealed the following layers:

Layer 1 (6 inches to 1 foot), a deposit of disturbed red earth containing near the surface broken pipe-stems of white man's make, burnt sticks, and a fragment of the calcaneum of a deer (*Cervus*). Next below this

Layer 2 (4 feet) showed a closely bedded mass of small limestone fragments containing a number of fine bat bones, but no discovered human trace. Below this

Layer 3 (6 inches to 2½ feet), a deposit of clay loam, rested upon the steeply sloping floor, and followed its irregularities.

Neither in Layer 2 nor in Layer 3 were any traces of hearths or of stained bands representing levels discolored by human presence during or before the deposition of the splinters in the cave. We were left to infer that the scanty signs of disturbance in Layer 1 represented the only period of human occupancy anywhere found, while that some of the charcoal gathered in it (like the seemingly axe-cut branch of Layer 1 in Queen Esther's room) had been placed there by white men rather than Indians, there could be little doubt.

The following is a complete list of the animal and molluscan remains found in the various diggings:

REMAINS OF ANIMALS FOUND IN DURHAM CAVE IN SEPTEMBER,
1893. IDENTIFIED BY PROFESSOR EDWARD D. COPE.

NOTE.—Q. E. signifies Queen Esther's Chamber. The depths are given in parentheses.

Chub (<i>Semotilus</i>), pharyngeal bone	Q. E., Layer 1
Catfish (<i>Amiurus</i>), pectoral spine	Q. E., Layer 1
Frog (<i>Rana</i> , large), 2 humeri, 2 femora, and ulno-radius	Q. E., Layer 1 (2d foot)
Frog (<i>Rana</i> , small), 2 tibio fibulae	Q. E., Layer 1 (2d foot)
Tortoise (<i>Cistudo</i>), piece of carapace	Q. E., Layer 1
Rattlesnake (<i>Crotalus</i>), 8 vertebrae	Q. E., Layer 1, depth undetermined
Water snake (<i>Natrix</i> or <i>Eutaenia</i>), 4 vertebrae	Q. E., Layer 1, depth undetermined
Snake (undetermined), rib	Trench 1, Layer 2 (5 feet 4 inches)
Grouse (<i>Bonasa</i>), skull bones	Q. E., Layer 1, depth undetermined
sacrum and pelvis	Q. E., Layer 1
2 femora	Trench 1, Layer 1 (6 feet)
tibia	Trench 1, not marked
Squirrel (<i>Sciurus</i>), humerus	Trench 1 (3 feet)
humerus and tibia	not marked
Beaver (<i>Castor fiber</i>), pelvis fibula and astragalus	Q. E., Layer 1
humerus	Q. E., Layer 1
ulna (?)	Q. E., Layer 2
tibia (gnawed)	Q. E., Layer 2
Porcupine (<i>Erethizon dorsatus</i>), 3 humeri, lower jaw with 3 molars, scapula, 2 ulnae, and 2 ischia	Q. E., Layer 1
lower incisor	Q. E., Layer 2
humerus	Trench 1 (2 feet 8 inches)
radius	Trench 1 (6 feet 10 inches)
femur	Trench 1 (3 feet 3 inches)
upper incisor	Trench 1 (4 feet)
lower incisor and ischium	site and depth not marked
Wood mouse (<i>Peromyscus</i>), lower jaw and teeth	Trench 1 (3 feet)
upper incisor and various bones	Trench 1 (5 feet 4 inches)

Rabbit (<i>Lepus</i>), metatarsal . . .	Trench 1, Layer 2 (7 feet)
ulna, pelvis, humerus, and lumbar vertebra	not marked
Carnivore (undetermined), lumbar vertebra	Q. E., Layer 1
tibia	Trench 3, Layer 1 (6 feet 2 inches)
(?) Fox (<i>Vulpes cinereoargenteus</i>), tibia	Trench 3, Layer 1 (6 feet 3 inches)
Black bear (<i>Ursus americanus</i>), canine tooth and lower sectorial molar	Q. E., Layer 1
Wild-cat (<i>Lynx rufus</i>), metacarpal (gnawed)	Q. E., Layer 1
Bat (undetermined), ulno-radius, humerus, and numerous bones with a skull	Q. E. surface
Peccary (<i>Mylohyus pennsylvanicus</i>), 2 vertebrae of young animals, and part of mandible (much gnawed)	Q. E., Layer 1
Deer (<i>Cariacus virginianus</i>), piece of humerus (split and gnawed), ilium (gnawed)	Q. E., Layer 1
temporal bone	Q. E., depth not marked
calcaneum	vestibule, depth not marked
ungual phalange	place and depth not marked
Elk (<i>Cervus canadensis</i>), part of antler (gnawed), possibly an Indian blade-handle	Trench 2, Layer 1 (2 feet)

REMAINS OF BATS FOUND IN DURHAM CAVE IN SEPTEMBER,
1893. IDENTIFIED BY DR. HARRISON ALLEN.

<i>Adelonycteris fusca</i> , 2 skulls, jaws, femora, tibiae, clavicles, and humeri, with two ulnas showing exostosis	Q. E., on or near the surface
<i>Vespertilio gryphus</i> , humerus and ulna with several bones . . .	Q. E., on or near the surface

REMAINS OF SHELLS FOUND IN DURHAM CAVE IN SEPTEMBER,
1893. IDENTIFIED BY PROFESSOR H. A. PILSBRY.

<i>Unio complanatus</i> , a small hole	
broken through the middle . . .	Q. E., Layer 1 (1 ½-2 feet)
<i>Pyramidula alternata</i> Say . . .	Q. E., surface
<i>Polygyra albolabris</i> Say, 2 species .	Q. E., surface
<i>Polygyra albolabris</i> Say	Q. E., depth undetermined
<i>Physa heterostrophia</i> Say	Q. E., depth undetermined
<i>Lymnaea catascopium</i> Say, 2 species	Q. E., depth undetermined

A SUMMARY.

Unsatisfactory and unfruitful as much of the digging had been, its results, taken as a whole, had not lacked significance. Having found reason to ascribe great archaeological importance to the site before the destruction of its roof, we had learned that the original rock bottom had not been blasted away, and therefore offered to the future investigator a chance for the discovery of significant human refuse layers somewhere under the recent rubbish in the amphitheatre (probably about 300 feet east of the cave pool). Where we had encountered cave earth the sites of our trenches were of necessity unsuited for the revelation of the evidence sought for. In these once dark inner regions we had failed to find anywhere a significant hearth-site, a jasper chip, a potsherd, or an Indian implement of bone or stone. The only valuable evidence consisted of the remains of animals, and though some of these may have been brought to the cave by white men, while not a few may have found their way thither from the forest in the jaws of carnivores, it seemed reasonable to suppose that others (as, for instance, the bones of the bear, elk, deer, and peccary) had constituted part of the refuse of Indian feasts in the outer cave, where, having been found by prowling animals, they had been carried to inner recesses and gnawed while still retaining their juices.

For the geological antiquity of man we had gathered no proof. The unfossilized bones, not more venerable in appearance than those found by me in Indian midden heaps on the Ohio and Tennessee Rivers,¹ were with one exception those of still existing animals, and assigned a comparatively modern date for the presence of any human cave visitor, who, after eating their flesh, had cast them aside. On the other hand, the investigation had supplied paleontology with evidence of value in the discovery of the bones of the extinct peccary (*Mylohyus pennsylvanicus*) mingled with the remains of still existing animals, if not with the contemporary refuse of Indian cookery. The animal indicated by the symphyseal part of the lower jaw with alveoli of teeth, referred to above (see Fig. 51), according to Professor Cope represents a species which "is quite different from any existing peccary, and belongs to a different genus (*Mylohyus* Cope) which is intermediate between *Dicotyles* and *Platygonus*. About the size of the living white-lipped peccary, the animal is of especial interest in view of its late persistence, as it was probably contemporary with the aboriginal so-called Indian. Neither this jaw nor those described by Leidy are fossilized. A peccary not distinguishable from this one, so far as the material permits me to judge, was found by Mr. Mercer in the Port Kennedy bone-fissure, in company with another species of *Mylohyus*."

These are desirable data for the history and genealogy of the peccary, and pertain to an unexplained gap in a kind of testimony which has been thus far either geologically ancient or quite recent. That the peccary was a familiar inhabitant of the area of the United States in Post-Glacial time, that it

¹ A surface Indian refuse heap at Macker's Station (right bank of Ohio River, 6 miles above the Kanawha's mouth) contained the bones of man, bear, gray fox, dog, elk, calf, opossum, raccoon, turkey, soft-shelled turtle, with union shells. Another on the left bank of the Tennessee River (near the mouth of the Nickajack Cave, Marion County, Tennessee) contained the remains of deer, tortoise, and rabbit along with the shells of existing fresh-water mollusca.

roamed the North American forests with the tapir, the mastodon, and the fossil sloth is a fact now as well established as the present existence of its modern representatives in subtrop-



FIG. 51 (actual size). — Fragment of the lower jaw and vertebrae of the extinct peccary (*Mylohyus pennsylvanicus*) found with the remains of still existing species (see Fig. 50) in Queen Esther's Chamber, Durham Cave, September, 1893.

ical America. Its bones have been dug out of lead-bearing fissures near Galena, Illinois, and unearthed with the remains of the mastodon in Benton County, Missouri. An almost complete skull reached the Academy of Natural Sciences of

Philadelphia from a saltpetre cave in Kentucky, and Lund exhumed skeletal fragments (representing according to him five species) from the Pleistocene caves of Brazil. The characteristic highly enamelled and many-lobed teeth, sometimes set in complete jaws, have confronted me at various depths in the bone-bearing chasm at Port Kennedy, Pennsylvania, where they were embedded with the remains of the sabre-toothed tiger, the fossil bear, the mastodon, sloth, and horse; and I have found them again at Zirkels' Cave in Tennessee in association with the fossil grizzly bear and tapir.¹ Such evidence, however, refers to an epoch in the past removed by many milleniums from the discovery of America, while to encounter the peccary in existence we must leave his earlier northern habitat altogether, for a region at least as far south as the Red River of Arkansas. Thenceforward to Patagonia, pairs or herds of the well-bristled, hog-like little animals, dark brown in color and from 30 to 40 inches long, represented by the collared *Dicotyles torquatus*, the more pugnacious and larger white-lipped *Dicotyles labiatus*, and the *Dicotyles angulatus*, range the wilder regions of South and Central America and Mexico. To the northward of the Red River limit evidence for the existence of the modern peccary seems to be wanting, and no credited tale of early explorer or modern hunter has to our knowledge asserted its presence in the middle northern or eastern United States since the coming of the white man.

When and how the tribe, which is as characteristic of the New World as is the hog (*Sus scrofa*) of the Old, became

¹ Naturalists, not without disagreement and correction of their own observations (see Leidy, *Dicotylinae of America*. Trans. Am. Phil. Soc., X., N.S., p. 323, and XI., N.S., p. 97), have attributed a series of several genera and species, fossil and living, to this animal, based on variations in the skull, the number and shape of the molar and incisor teeth, and the strength of the canines. Flower and Lydekker (see *Animals Living and Extinct*. London, Black, 1893) are disposed to reduce the genera to one, namely, *Dicotyles*, but Professor Cope gives me the following list of genera and species :

extinct in the north, and why it migrated southward, are questions still unanswered. We may suppose that its abandonment of the United States is linked with the changes in climate or the vicissitudes, as yet little understood, that attended the melting of the great glacier, with the similar desertion of North America by the tapir and the mysterious extinction of the American horse.

But whatever the cause of this episode in the fate of the peccary, the little known period during which the change occurred is of as much interest to the student of man's antiquity as to the paleontologist. For the two sciences it constitutes the meeting-ground, since an earlier fauna perished in it, since

- (1) DICOTYLES CUV., distinguished by teeth crowned with tubercles, 6 incisors, and 3 premolars, and represented by 2 fossil and 3 living species, namely,
 - D. serus* (fossil), found in the Miocene deposits of the Loup Fork Epoch ;
 - D. lenis* (fossil), found in a mixed or superficial deposit in Maryland ;
 - D. angulatus* (living), called the *javalin*, the most northerly species of the series, now ranging Central America and Texas ;
 - D. torquatus* (living), the collared peccary, common in South America as far north as Darien ; and
 - D. labiatus* (living), the white-lipped peccary, now inhabiting South and Central America.
- (2) MYLOHYUS COPE, distinguished by tubercular teeth, 4 incisors, 3 premolars, and weak canines, and represented by 2 species, both fossil, namely,
 - M. pennsylvanicus*, attested by the remains from Durham Cave, described above, and found at Port Kennedy ; and
 - M. nasutus*, from Pleistocene deposits in the United States.
- (3) PLATYGONUS LEC., distinguished by teeth with fused tubercles and resembling those of the tapir, 4 incisors, and 3 premolars, and represented by 4 species, all fossil, namely,
 - P. vetus*, found in a limestone crevice in Mifflin County, Pennsylvania ;
 - P. compressus*, common in Pleistocene deposits ;
 - P. bicalcaratus*, found in the Pliocene beds of Texas ; and
 - P. altamirani*, discovered in the late Tertiary deposits of Mexico.
- (4) BOTHROLABIS COPE, distinguished by tubercular teeth, 6 incisors, and 4 premolars, and represented by 4 species, all fossil, namely,
 - B. pristinus*,
 - B. trichacnus*,
 - B. rostratus*,
 - B. subaequans*, all from the middle Miocene beds of Oregon.

soon or late in it man appeared, coming from an undetermined direction, widening the sphere of his existence in a way as yet unexplained, and bearing a still unknown relation to extinct animals. If it is worth the pains of archaeology to penetrate into this domain of the naturalist and seek to fix a geological date for the advent of humanity in the New World, then discoveries like this at Durham Cave are important, and prepare us to establish landmarks in the pre-Columbian darkness.

We had found a peccary who had undoubtedly far outlived the epoch usually attributed to the animal, and to suppose that the Indian had encountered it was no more unreasonable than to suppose that he had encountered the common deer represented by the cracked bones lying near. Yellow and fresh-looking, the jaw and vertebrae presented no greater appearance of antiquity than the surrounding remains of recent animals, which like them had been gnawed by rodents while still fresh enough for food.

Modernized by their surroundings, they failed to lend the color of an older genealogy of animals to the situation. As in the case of the sloth of Big Bone Cave, Tennessee,¹ as with the tapir and mylodon at the Lookout Cavern,² as with the superficial mammoth remains at Big Bone Lick, or as evidenced in the Indian picture-writing known as the Lenape Stone,³ they present us with a reason for supposing that, in some cases at least, the process of extinction was gradual, and that not a few representatives of the more ancient epoch survived their fellows.

¹ See Preliminary Report distributed by the University of Pennsylvania for June 4, 1896; also *American Naturalist* for July, 1896, and *Scientific American* for a July issue, 1896.

² See bulletin of Cave Exploration distributed by the University of Pennsylvania for July 4, 1894.

³ Regarded as a fraudulent relic by Dr. D. G. Brinton on general principles, but whose authenticity I cannot find just reason to doubt. See *The Lenape Stone, or the Indian and the Mammoth*. By H. C. Mercer. New York, Putnam, 1883.

At Hartman's Cave, fifty miles up the river, Mr. T. D. Paret (see Annual Report of Geological Survey of Pennsylvania, 1887, Cave Fossils, p. 1, plate II) found a fresh-looking jaw of a peccary identical in species with the Durham Cave animal, and described by Leidy as *Dicotyles pennsylvanicus* (by Cope as *Mylohyus pennsylvanicus*), associated with the extinct *Castoroides ohioensis* and the migrated caribou and bison; also with the modern lynx, gray fox, skunk, weasel, raccoon, mole, bat, woodchuck, porcupine, beaver, muskrat, gray squirrel, ground squirrel, meadow mouse, white-footed mouse, wood rat, gray rabbit, deer, and elk.¹ But at Durham the association as far as it goes appears yet more modern, and seems conclusively to set a limit to our conception of the antiquity of one species at least of the northwardly extinct animal in question, which thus within a comparatively few centuries seems to have been a denizen of the Pennsylvanian forest.

¹ Also wild turkey, box turtle, snapper, several snakes, and the shells of the snails, *Helix albolabris*, *H. alternata*, and *H. tridentata*, and the river mussel, *Unio complanatus* and *Margaritina margaritifera*, not now found in the neighboring Delaware River, with the seeds of dogwood, pignut, and walnut.



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